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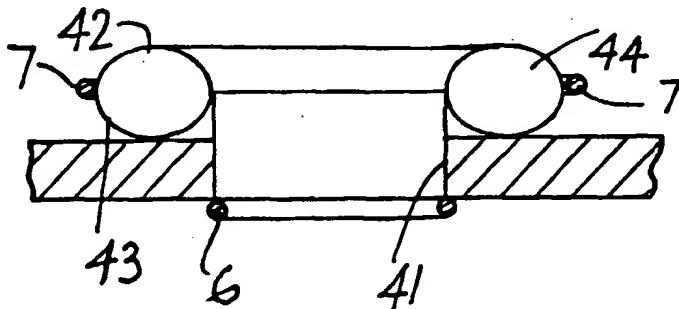
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991053	16 December 1999 (16.12.1999)	IE
00650010.2	18 February 2000 (18.02.2000)	EP

(71) Applicant (*for all designated States except US*): ATRO-POS LIMITED [IE/IE]; Unit 4 Sunnybank Centre, Upper Dargle Road, Bray, County Wicklow (IE).**Published:**— *With international search report.**For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: A RETRACTOR

WO 01/26559 A1  
insertion configuration with a reduced radial dimension and a retracting configuration. The outer portion (42, 43) is pulled laterally by inflating the chamber (44) to retract the wound opening (2) laterally.

(57) Abstract: A retractor (40) for retracting the margins of an abdominal wound opening (2) comprises an inner anchoring O-ring (6) for insertion into the wound opening (2) and an outer retracting O-ring (7) for positioning outside the wound opening (2). A sleeve connecting member extends between the inner (6) and outer O-rings (7), and has a conical wound engaging portion (41) and a conical outer portion (42, 43) which includes an inflatable chamber (44). The wound engaging portion (41) has an

## “A RETRCTOR”

### Introduction

5      The invention relates to a surgical wound retractor. In particular the invention relates to a retractor for retracting the margins of an incision to provide maximum exposure of an organ or body structures for access for surgical procedures.

10     Various retractors are known. However in general known retractors are difficult and cumbersome to use, and/or are relatively complex and consequently expensive.

15     This invention is directed towards providing an improved wound retractor which will overcome at least some of these problems.

### Statements of Invention

According to the invention there is provided a surgical wound retractor  
20 comprising:

an inner anchoring ring for insertion into a wound opening to be retained inside the wound opening;

25     an outer retracting means for positioning outside of the wound opening; and

          a connecting member extending between the anchoring ring and the retracting means,

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the connecting member having an inner wound engaging portion and an outer portion, at least the inner wound engaging portion having an insertion configuration with a reduced radial dimension and a retracting configuration,

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the outer portion of the connecting member being pulled laterally by the outer retracting means to urge the wound engaging portion to the retracting configuration.

10 In a preferred embodiment of the invention the outer retracting means comprises a ring having a larger diameter than that of the inner anchoring ring.

Preferably the outer retracting means is biased to urge the connecting member into the retracting configuration.

15

In one embodiment the retracting means is of a semi-rigid material. The retracting means may also be at least partially of a shape memory material such as nitinol. In one embodiment the retracting means comprises a ring.

20 In a preferred embodiment at least the wound engaging portion of the connecting member is of generally cylindrical shape.

Alternatively at least the wound engaging portion of the connecting member is of generally conical shape.

25

In a preferred embodiment at least the outer portion of the connecting member has a lateral component. Preferably at least the outer portion of the connecting member is of generally conical shape.

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In one particularly preferred embodiment the retracting means includes an inflatable chamber. The inflatable chamber is preferably provided on at least portion of the connecting member. In one arrangement the inflatable chamber is provided on the outer portion of the connection member. In another 5 arrangement the inflatable chamber is provided on the inner and outer portions of the connecting member.

In one embodiment the retractor includes retaining means for retaining the outer portion of the connecting member substantially flat in the region surrounding the 10 wound opening. The retaining means may comprise a release adhesive or the retaining means comprises a clamp.

Preferably the connecting member is of pliable material. Ideally the connecting member is of a plastics material. In one embodiment the connecting member is 15 of an elastic material.

The anchoring ring is preferably of flexible material.

In another aspect the invention provides a method for retracting a surgical 20 wound using a surgical retractor comprising an inner anchoring ring, an outer retracting means and a connecting member extending between the inner anchoring ring and the outer retracting means, the connecting member having an insertion configuration with a reduced radial dimension and a retracting configuration, the connecting member further having an inflatable chamber 25 thereon, the method comprising the steps of:-

gripping the inner anchoring ring and the wound engaging portion of the 30 connecting means to move the anchoring ring and the connecting means into an insertion configuration in which the wound engaging portion of the connecting member has a reduced radial dimension;

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releasing the anchoring ring inside the wound opening to retain the anchoring ring inside the wound opening; and

5 inflating the chamber to urge the wound engaging portion into the retracting configuration.

Brief Description of the Drawings

10 The invention will be more clearly understood from the following description thereof given by way of example only with reference to the accompanying drawings, in which:-

Fig. 1 is a perspective view from below of a wound retractor according to the invention;

15

Fig. 2 is a side cross sectional view of the retractor of Fig. 1;

Figs. 3(a) to 3(c) are perspective views of the retractor of Fig. 1 in use;

20

Fig. 4 is a side cross sectional view of the retractor of Fig. 1 in the position of Fig. 3(c);

Fig. 5 is a perspective view from below of another wound retractor according to the invention;

25

Fig. 6 is a side cross sectional view of the retractor of Fig. 5;

Fig. 7 is a perspective view from below of another wound retractor according to the invention;

30

Fig. 8 is a side cross sectional view of the retractor of Fig. 7;

- 5 -

Fig. 9 is a perspective view from above of another wound retractor according to the invention;

Fig. 10 is a plan view of the retractor of Fig. 9;

5

Fig. 11 is a cross sectional view along the line A-A in Fig. 10;

10

Figs. 12 to 14 are side cross sectional views of the retractor of Figs. 9 to 11 in use;

15

Fig. 15(a) is a perspective view from above of another wound retractor according to the invention in an uninflated configuration;

15

Fig. 15(b) is a perspective view from above of the retractor of Fig. 15(a) inflated; and

Fig. 15(c) is a partially cut away perspective view of the retractor of Figs. 15(a) and 15(b) in use.

20

### Detailed Description

25

Referring to the drawings and initially to Figs. 1 to 4 thereof, there is illustrated a surgical wound retractor 1 according to the invention, which is used to retract the margins of an incision such as an abdominal wound opening 2, as illustrated in Figs. 3(a) to 3(c).

30

The retractor 1 comprises an inner anchoring ring in the form of an inner O-ring 6 of flexible material for insertion into the wound opening 2 to be retained in the wound opening 2, and an outer retracting means, in this case in the form of an outer O-ring 7. The outer ring 7 is of a larger diameter than, and of a material

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which is rigid relative to, the inner O-ring 6, for positioning outside the wound opening 2. A connecting member in the form of a sheet 9 of pliable plastics material extends between the inner ring 6 and the outer ring 7 to retract and protect the wound opening 2.

5

The sheet 9 has an inner wound engaging portion, in this case provided by a distal substantially cylindrical sleeve portion 10 attached to and extending from the inner O-ring through the wound opening 2, and an outer portion, in this case provided by a proximal conical sleeve portion 11 extending from the distal sleeve portion 10 out of the wound opening 2 to the outer ring 7, to which the sleeve portion 11 is attached. The distal sleeve portion 10 has an insertion configuration with a reduced radial dimension and a retracting configuration.

In use the inner O-ring 6 and the distal sleeve portion 10 are scrunched up to form the insertion configuration and the inner O-ring 6 is inserted into the wound opening 2, as illustrated in Figs. 3(a) and 3(b). On release of the inner O-ring 6, the O-ring 6 overlaps the inner edge of the wound opening 2 to provide a secure anchoring of the retractor 1 in the wound, and the outer O-ring 7 is biased into a distorted non-planar shape due to the compressive forces exerted on the sheet 9 by the margins of the wound.

The proximal sleeve portion 11 is then pulled laterally by flattening out the outer O-ring 7 into its normal O-shape around the wound opening 2. On flattening, the distal sleeve portion 10 is pulled into the retracting configuration which retracts the wound opening 2 laterally, as illustrated in Figs. 3(c) and 4.

To retain the proximal sleeve portion 11 in the flattened out wound retracting configuration any suitable retaining means such as a clamp may be used. Alternatively or additionally a releasable adhesive may be used to bond the sleeve portion 11 to a fixture and/or to the skin around the wound opening 2.

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In the retracted configuration the distal sleeve portion 10 lines the side of the wound opening 2 thereby protecting the exposed tissue of the wound margins, as illustrated in Figs. 3(c) and 4.

5 The invention provides a surgical wound retractor of simple construction which is easy to use and can be manufactured inexpensively to provide a disposable unit.

10 The wound retractor according to the invention may be used to maintain a wound in a retracted configuration indefinitely without requiring intervention by a clinician to prevent closure of the wound opening.

15 A portion of the connecting member extends proximally out of the wound opening in use. Thus the retractor is suitable for use with a range of incision sizes and patient anatomies.

20 Referring to Figs. 5 and 6 there is illustrated another wound retractor 20 according to the invention which is similar to the retractor 1 of Figs. 1 to 4 and like parts are assigned the same reference numerals in Figs. 5 and 6. In this case the inner wound engaging portion is provided by a distal cylindrical sleeve portion 21 which is relatively short, and the outer portion is provided by a proximal disc-shaped sleeve portion 22. In use the retractor 20 operates in a manner similar to the retractor 1 of Figs. 1 to 4.

25 Referring to Figs. 7 and 8 there is illustrated a further wound retractor 30 according to the invention which is similar to the retractors 1, 20 of Figs. 1 to 6 and like parts are assigned the same reference numerals in Figs. 7 and 8. In this case the sleeve 9 comprises a single disc-shaped portion 31 of elastic material. In use the inner O-ring 6 is inserted into the wound opening 2 and pulled so that 30 part of the sleeve 9 extends through the wound opening 2 to form the inner

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wound engaging portion and part extends out of the wound opening 2 to form the outer portion by virtue of the elasticity of the sleeve. The outer portion is pulled laterally to retract the wound opening 2 as described previously with reference to Figs. 1 to 4.

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Referring to Figs. 9 to 14 there is illustrated another wound retractor 40 according to the invention which is similar to the retractor 1 described with reference to Figs. 1 to 4 and like parts are assigned the same reference numerals in Figs. 9 to 14.

10

In this case the inner wound engaging portion is provided by a distal conical sleeve portion 41 of pliable material attached to and extending from the inner O-ring 6 through the wound opening 2. The outer portion is provided by a proximal inner sheet 42 of pliable material and a proximal outer sheet 43 of pliable material sealed between the distal sleeve portion 41 and the outer O-ring 7 in spaced-apart relation to define a chamber 44 therebetween, as illustrated in Fig. 11. An inflation port 45 is provided on the inner sheet 42 for inflation of the chamber 44. The outer portion has a generally conical shape.

15

In use the inner O-ring 6 is inserted into the wound opening 2, as illustrated in Figs. 12(a) and 12(b) and as described previously with reference to Figs. 1 to 4, and the compressive forces exerted on the distal sleeve portion 41 by the margins of the wound act to collapse the sleeve. The proximal sheets 41, 42 are pulled laterally by flattening out the outer O-ring 7 into its normal O-shape around the wound opening 2 to cause a primary partial retraction of the wound opening 2, as illustrated in Fig. 13. As may be seen from Fig. 13 the distal sleeve portion 41 remains in partial compression after this primary retraction.

20

The chamber 44 is then inflated to pull the distal sleeve portion 41 laterally and thereby urge the distal sleeve portion 41 into the retracted configuration, as

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illustrated in Fig. 14. The inflation of the chamber 44 will maintain the wound opening 2 retracted without requiring additional retaining means.

An additional advantage of this embodiment is that by altering the pressure in  
5 the inflation chamber the retraction force exerted on the margins of the wound may be easily and accurately controlled to suit a particular incision size, a patient anatomy or a surgical procedure to be performed.

It will be appreciated that part of the outer portion of the sleeve may extend  
10 through the wound opening 2 after insertion of the inner O-ring 6.

The conical shape of the outer portion ensures that in the inserted, uninflated configuration of fig. 13, the proximal sheets 41, 42 are wrinkled. Inflation of the  
15 chamber 44 is possible without stretching the material of the proximal sheets 41, 42 and thus there is no resistance to the distal sleeve portion 41 moving laterally to cause retraction of the wound opening 2.

Referring to Figs. 15(a) to 15(c) there is illustrated another wound retractor 50 which is similar to those described above. In this case an inner sheet 52 and an  
20 outer sheet 53 are sealed between the rings 6, 7 in spaced apart relation to define an inflatable chamber 51 therebetween, as illustrated in Fig. 15(c). An inflation port 54 is provided in the inner sheet 52 for inflation of the chamber 51. In use a distal portion of the inflatable chamber 51 extends through the wound opening 2 to form the wound engaging portion and a proximal portion extends laterally  
25 around the wound opening 2 to form the outer portion, and inflation of the chamber 51 causes retraction of the wound opening 2, as illustrated in Fig. 15(c).

It will be appreciated that inflation may be used as at least portion of the retraction means for achieving lateral retraction of the wound opening in any of  
30 the devices of the invention.

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The wound retractor may be constructed in any annular shape. For example the inner and outer rings may be oval, elliptical or circular.

The invention is not limited to the embodiments hereinbefore described which  
5 may be varied in both construction and detail.

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CLAIMS

1. A surgical wound retractor comprising:

5 an inner anchoring ring for insertion into a wound opening to be retained inside the wound opening;

an outer retracting means for positioning outside of the wound opening; and

10 a connecting member extending between the anchoring ring and the retracting means,

15 the connecting member having an inner wound engaging portion and an outer portion, at least the inner wound engaging portion having an insertion configuration with a reduced radial dimension and a retracting configuration,

20 the outer portion of the connecting member being pulled laterally by the outer retracting means to urge the wound engaging portion to the retracting configuration.

25 2. A retractor as claimed in claim 1 wherein the outer retracting means comprises a ring having a larger diameter than that of the inner anchoring ring.

30 3. A retractor as claimed in claim 1 or 2 wherein the outer retracting means is biased to urge the connecting member into the retracting configuration.

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4. A retractor as claimed in claim 2 or 3 wherein the retracting means is of a semi-rigid material.
5. A retractor as claimed in claim 2 or 3 wherein the retracting means is at least partially of a shape memory material.
6. A retractor as claimed in any preceding claim wherein the retracting means comprises a ring.
- 10 7. A retractor as claimed in any preceding claim wherein at least the wound engaging portion of the connecting member is of generally cylindrical shape.
- 15 8. A retractor as claimed in any of claims 1 to 6 wherein at least the wound engaging portion of the connecting member is of generally conical shape.
9. A retractor as claimed in any preceding claim wherein at least the outer portion of the connecting member has a lateral component.
- 20 10. A retractor as claimed in any preceding claim wherein at least the outer portion of the connecting member is of generally conical shape.
11. A retractor as claimed in any preceding claim wherein the retracting means includes an inflatable chamber.
- 25 12. A retractor as claimed in claim 11 wherein the inflatable chamber is provided on at least portion of the connecting member.
13. A retractor as claimed in claim 12 wherein the inflatable chamber is provided on the outer portion of the connection member.

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14. A retractor as claimed in claim 12 or 13 wherein the inflatable chamber is provided on the inner and outer portions of the connecting member.
- 5 15. A retractor as claimed in any preceding claim including retaining means for retaining the outer portion of the connecting member substantially flat in the region surrounding the wound opening.
- 10 16. A retractor as claimed in claim 15 wherein the retaining means comprises a release adhesive.
- 15 17. A retractor as claimed in claim 15 wherein the retaining means comprises a clamp.
18. A retractor as claimed in any preceding claim wherein the connecting member is of pliable material.
19. A retractor as claimed in any preceding claim wherein the connecting member is of an elastic material.
- 20 20. A retractor as claimed in any preceding claim wherein the connecting member is of a plastics material.
21. A retractor as claimed in any preceding claim wherein the anchoring ring is of flexible material.
- 25 22. A retractor substantially as hereinbefore described with reference to the accompanying drawings.
23. A method for retracting a surgical wound using a surgical retractor comprising an inner anchoring ring, an outer retracting means and a

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connecting member extending between the inner anchoring ring and the outer retracting means, the connecting member having an insertion configuration with a reduced radial dimension and a retracting configuration, the connecting member further having an inflatable chamber thereon, the method comprising the steps of:-

10

gripping the inner anchoring ring and the wound engaging portion of the connecting means to move the anchoring ring and the connecting means into an insertion configuration in which the wound engaging portion of the connecting member has a reduced radial dimension;

releasing the anchoring ring inside the wound opening to retain the anchoring ring inside the wound opening; and

15

inflating the chamber to urge the wound engaging portion into the retracting configuration.

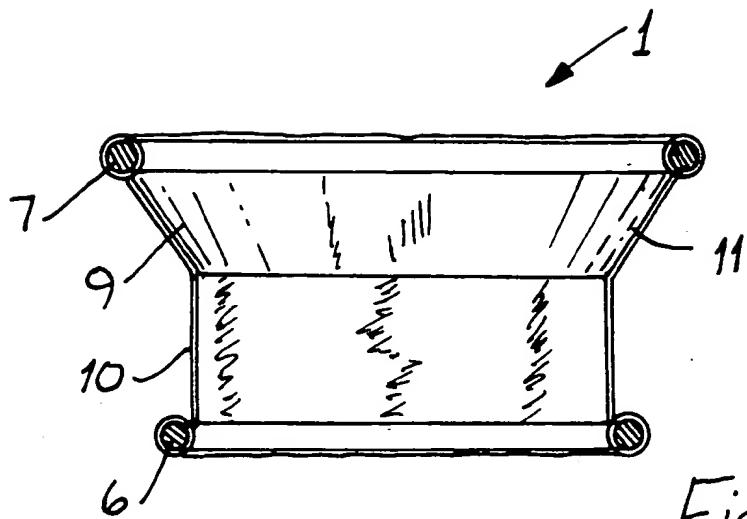


Fig. 2

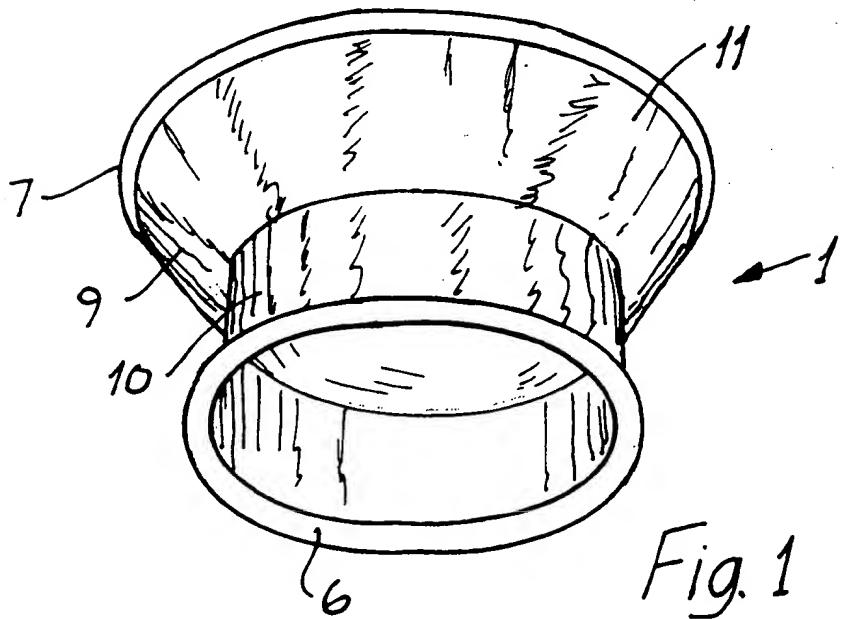


Fig. 1

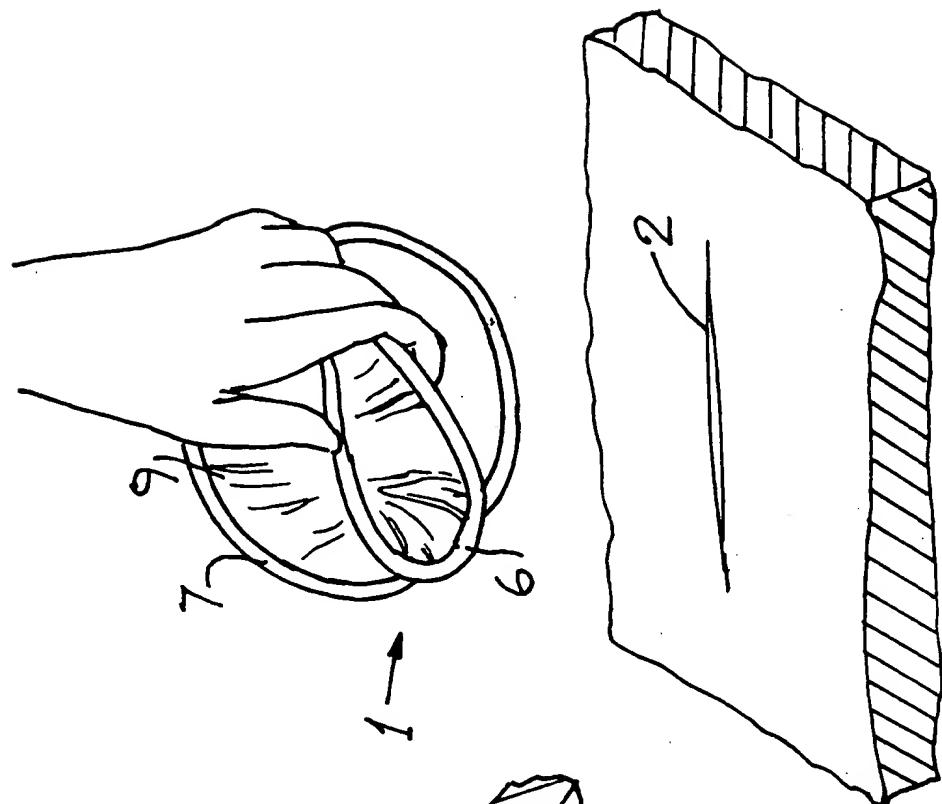


Fig. 3 (a)

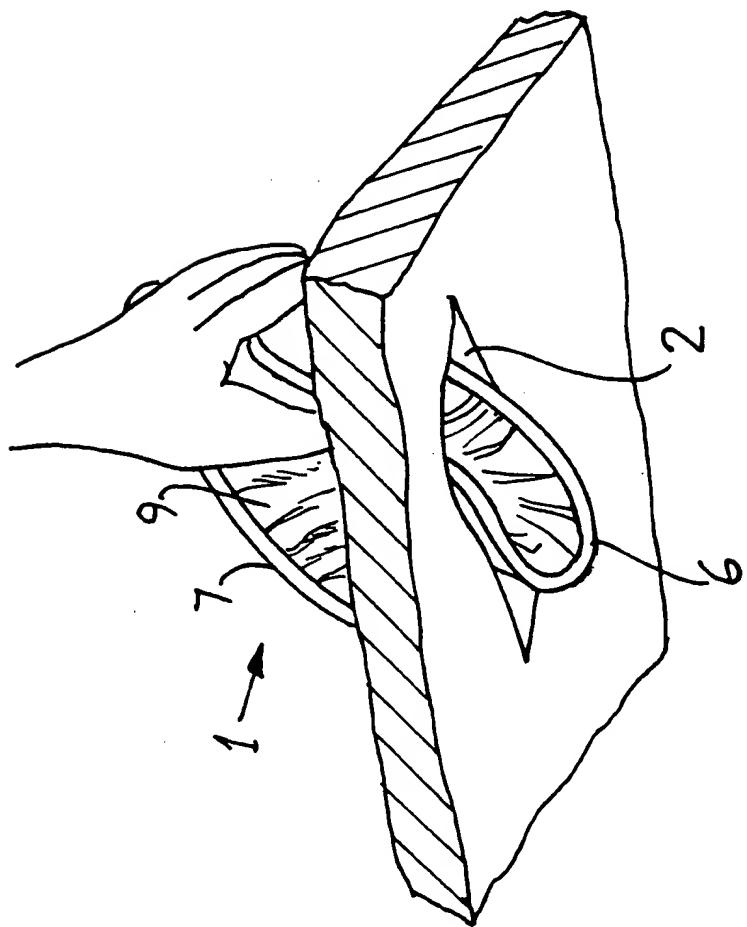
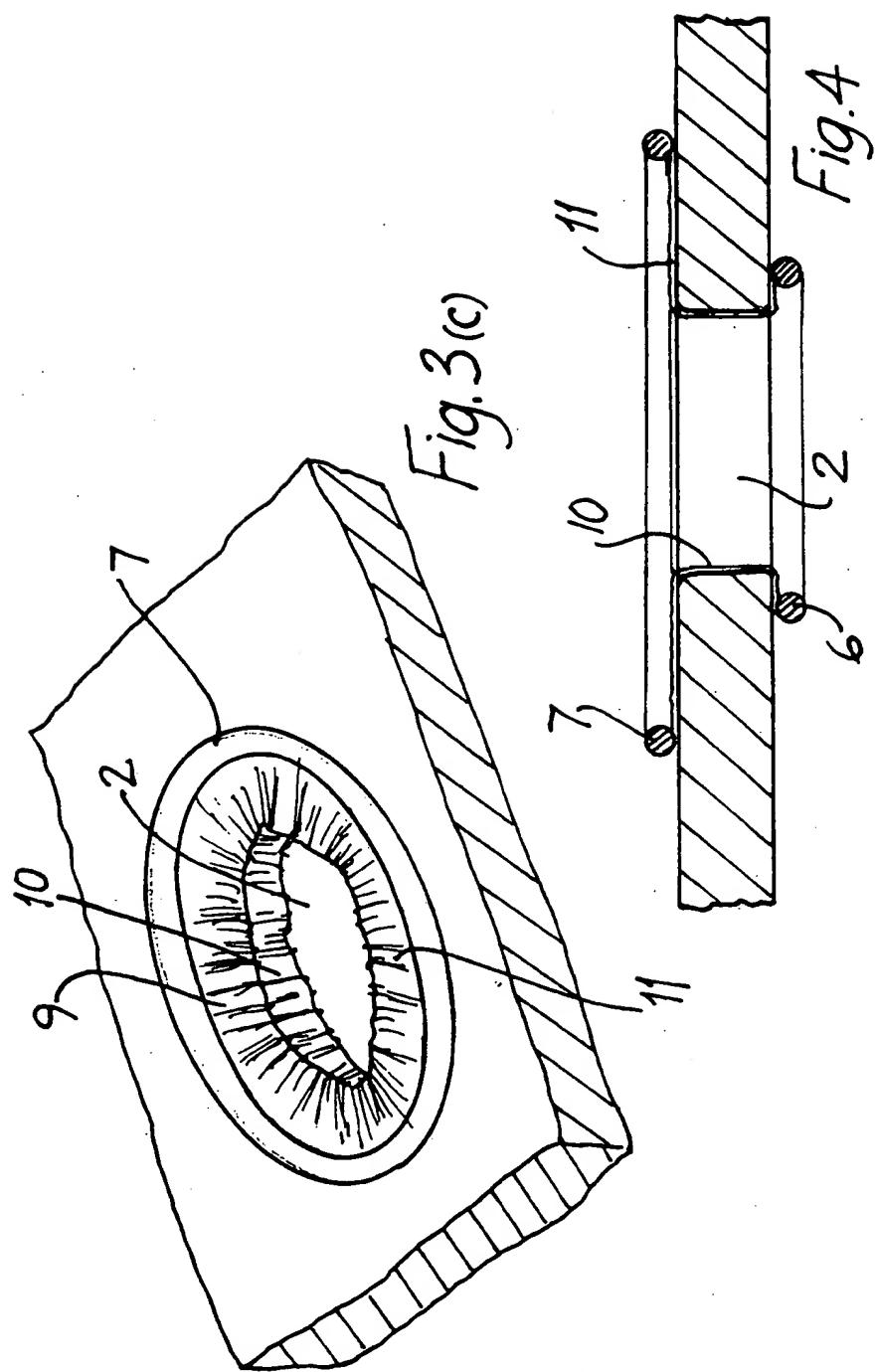
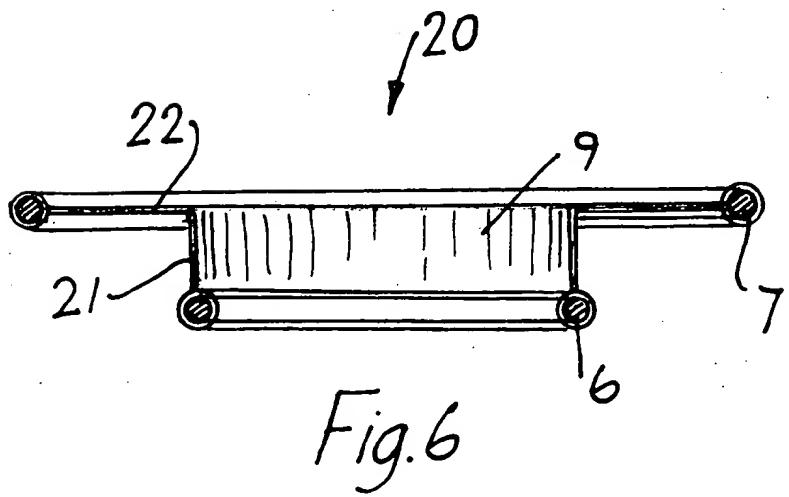
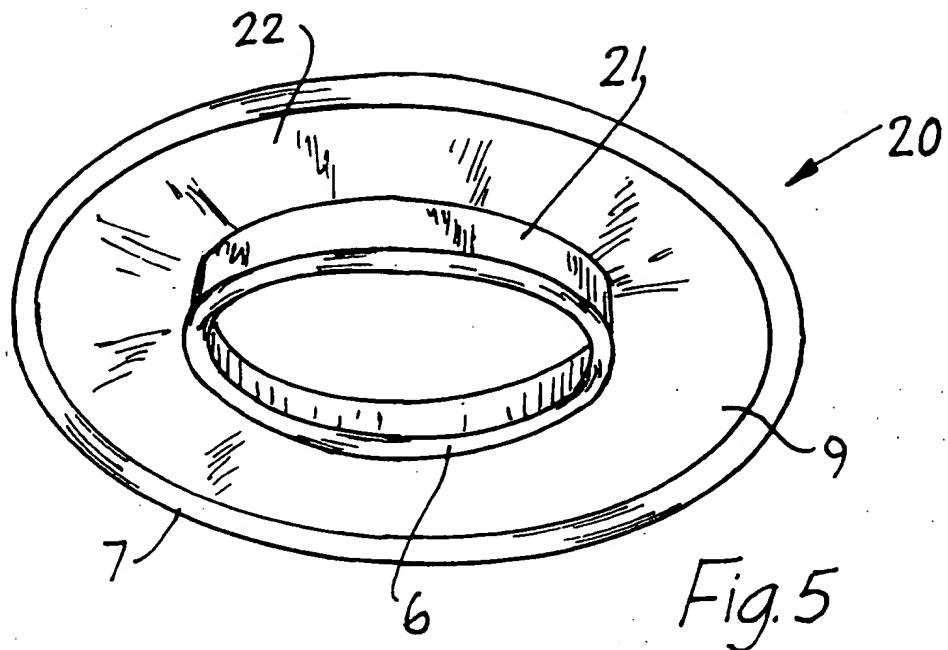
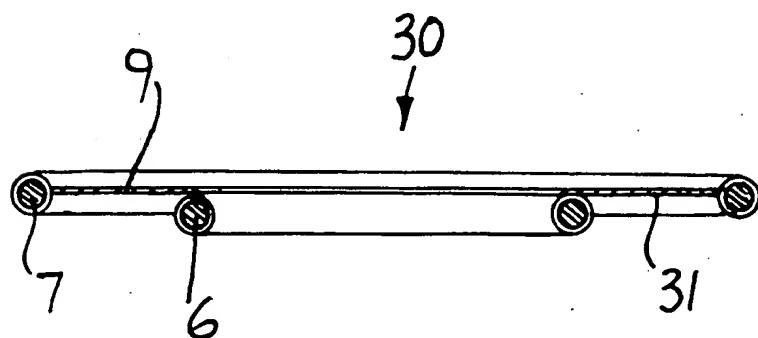
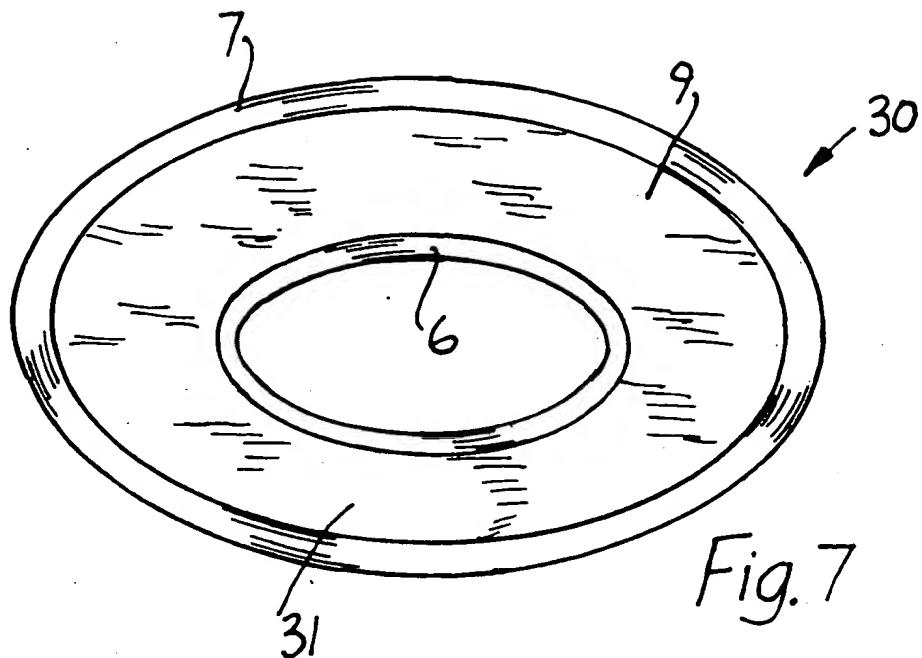
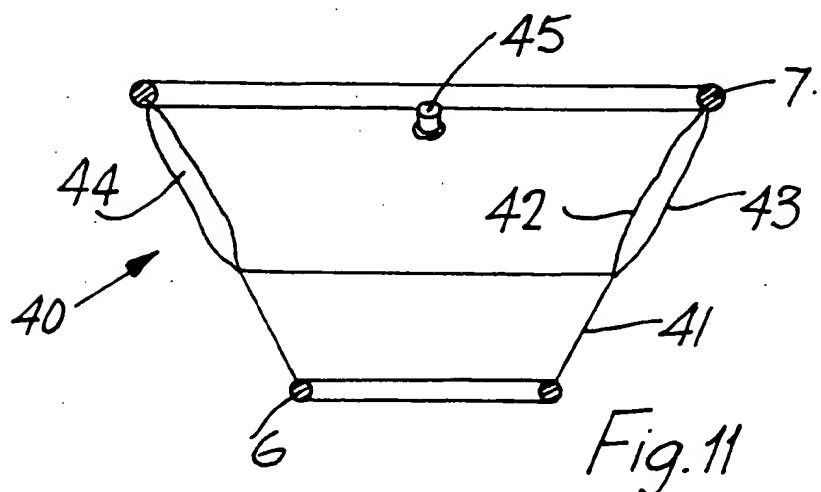
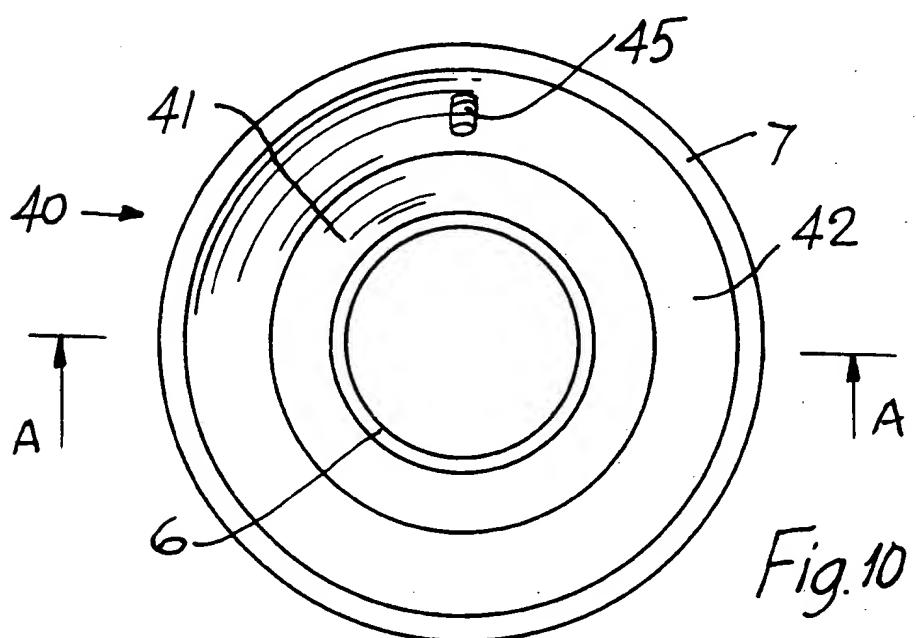
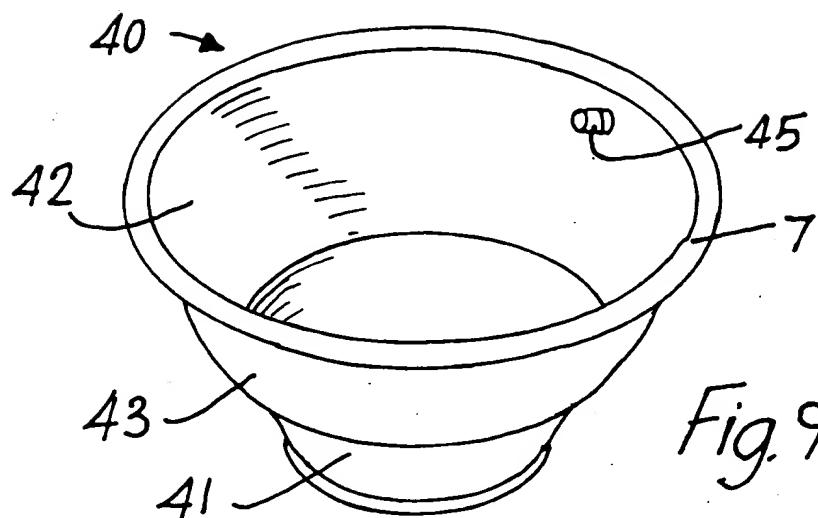


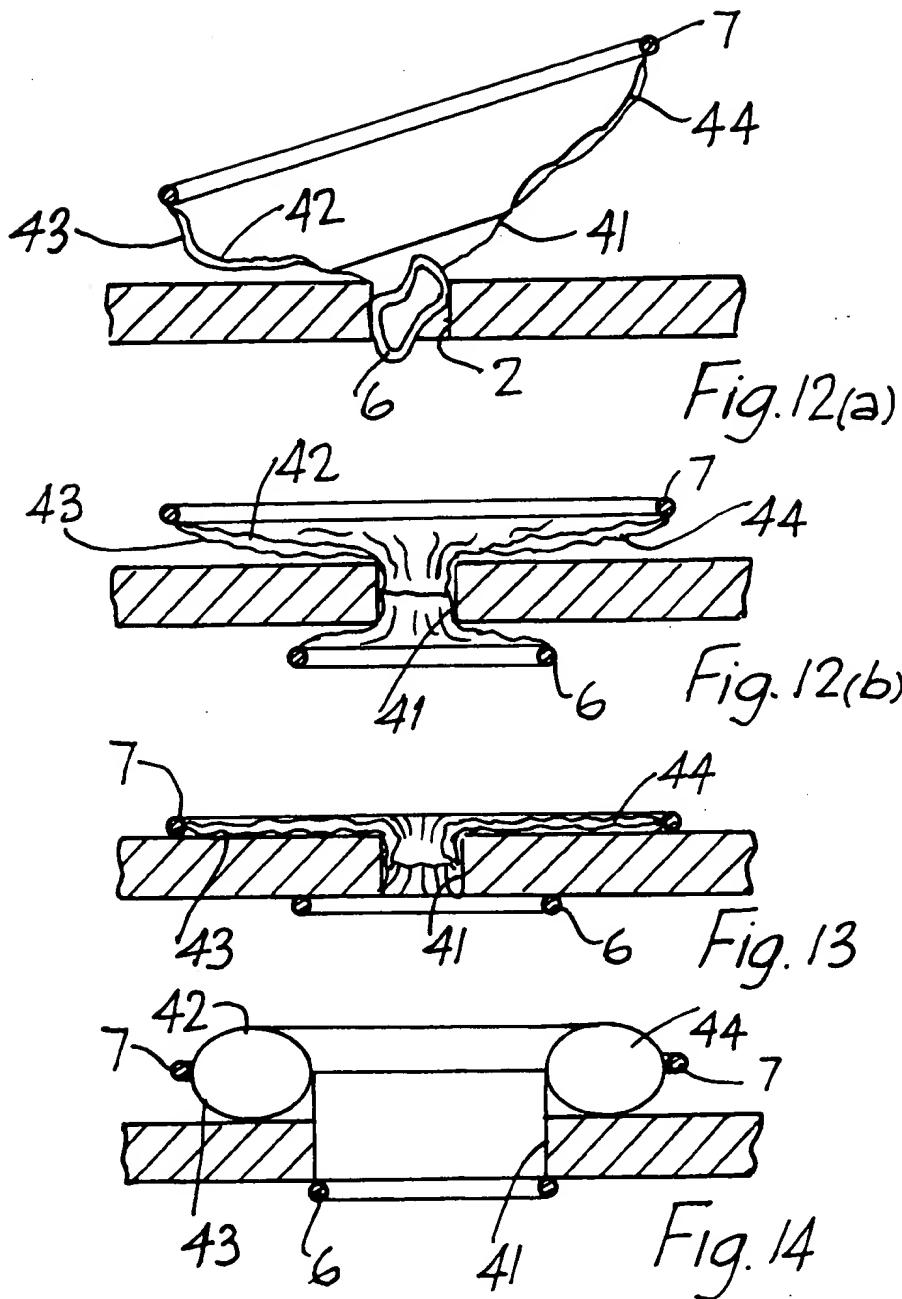
Fig. 3(b)

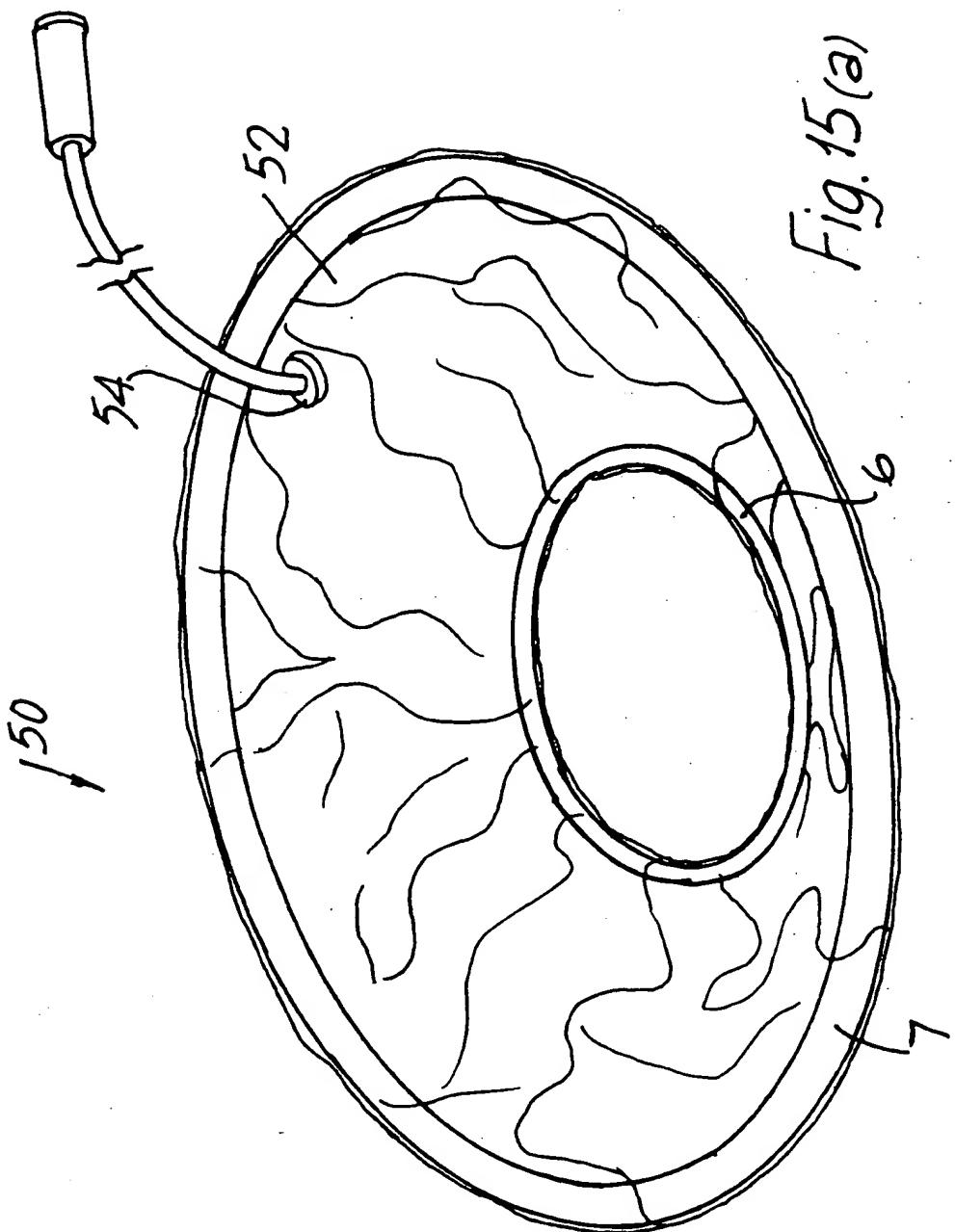


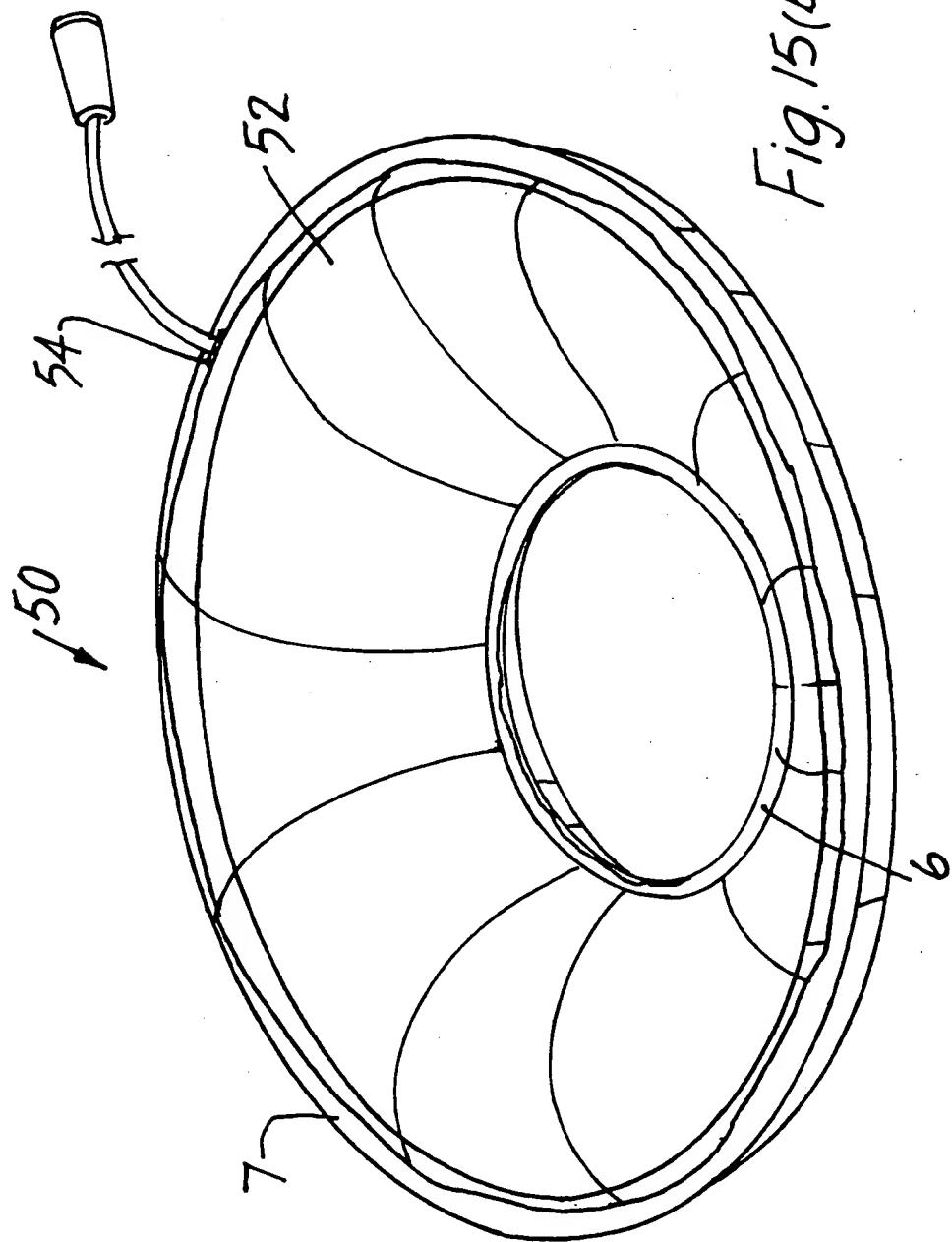


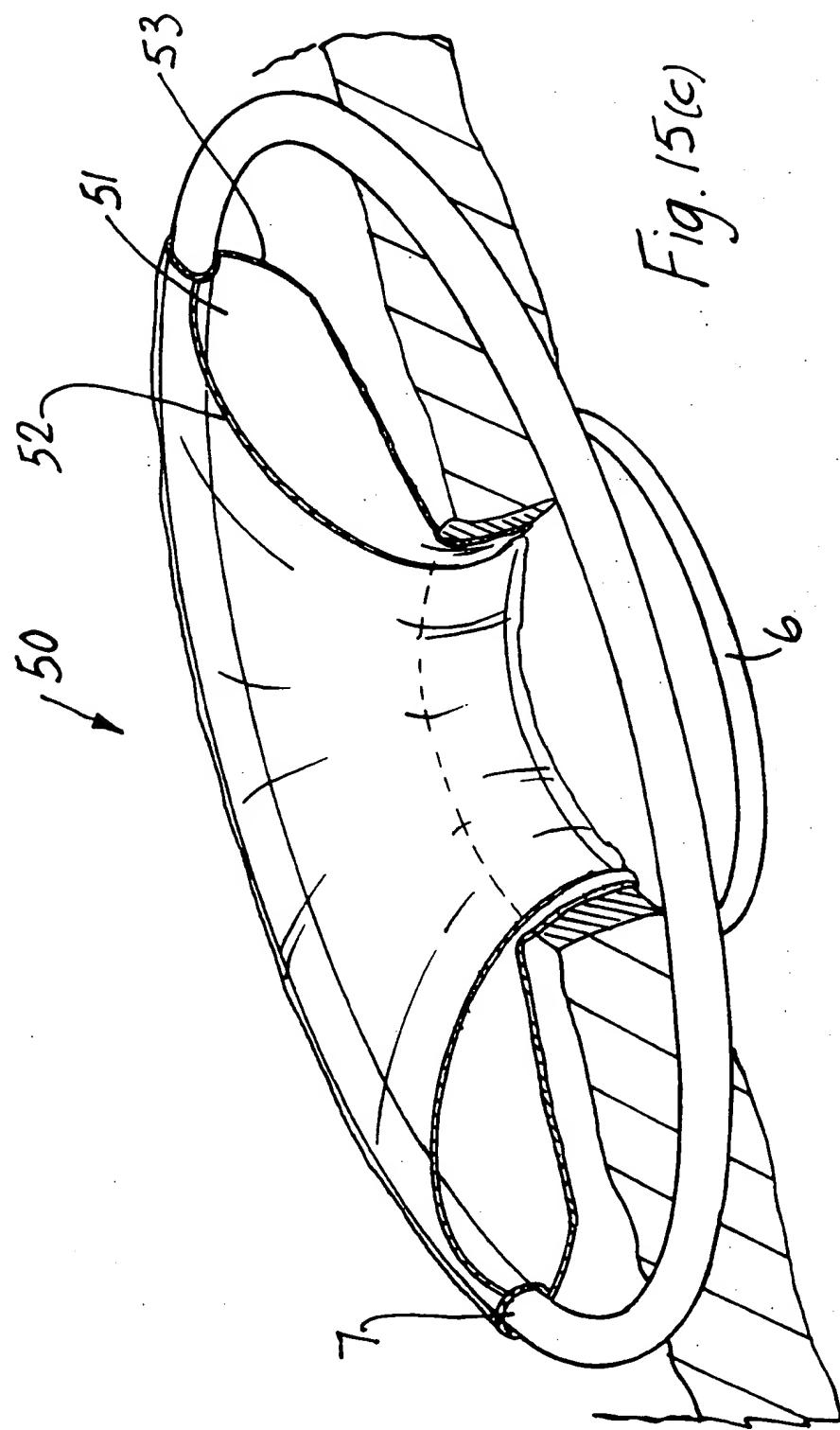












# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IE 00/00127

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 A61B17/02 A61B17/34

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 98 48724 A (UNIVERSITY OF MASSACHUSETTS) 5 November 1998 (1998-11-05) page 23, line 1 -page 24, line 4; figures 8,9	1,3,4, 6-13, 18-21
Y	---	2,5,15, 16
Y	US 5 810 721 A (MUELLER ET AL.) 22 September 1998 (1998-09-22) abstract; figures column 6, line 27-58 column 9, line 48 -column 10, line 17 ----	2,5,15, 16
		-/-

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

\* Special categories of cited documents :

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

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- \*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search

11 January 2001

Date of mailing of the international search report

19/01/2001

Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/IE 00/00127

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 366 478 A (BRINKERHOFF ET AL.) 22 November 1994 (1994-11-22)  abstract; figures 1-4 column 4, line 14 -column 5, line 19 ---	1, 3, 4, 6, 11, 12, 14, 18-21
X	US 5 524 644 A (CROOK) 11 June 1996 (1996-06-11) the whole document ---	1, 3, 4, 6, 7, 18-21
X	GB 1 151 993 A (HARROWER) 14 May 1969 (1969-05-14) page 1, line 90 -page 2, line 44 page 2, line 75-90; figures -----	1, 3, 4, 6, 7, 18-21

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

Continuation of Box I.2

Claims Nos.: 22

The subject matter of claim 22 is defined by reference to the description and drawings which is not allowed by the PCT (see Rule 6.2 PCT). The claims do not define any clear structural features or limitations. Consequently, the scope of the claim is not clear (see Article 6 PCT) and meaningful search is not possible (see Article 17 PCT).

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IE 00/00127

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